The landscape record of blind fault earthquakes

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ABSTRACT

Active faults capable of generating highly damaging earthquakes may not cause surface rupture (i.e., blind faults) or cause surface ruptures that evade detection due to subsequent burial or erosion by surface processes. Fault populations and earthquake frequency-magnitude distributions adhere to power laws, implying that faults too small to cause surface rupture but large enough to cause localized strong ground shaking densely populate continental crust. The rupture of blind, previously undetected faults beneath Christchurch, New Zealand in a suite of earthquakes in 2010 and 2011, including the fatal 22 February 2011 moment magnitude (M_w) 6.2 Christchurch earthquake and other large aftershocks, caused a variety of environmental impacts, including major rockfall, severe liquefaction, and differential surface uplift and subsidence. All of these effects occurred where geologic evidence for penultimate effects of the same nature existed. To what extent could the geologic record have been used to infer the presence of proximal, blind and / or unidentified faults near Christchurch? In this instance, we argue that phenomena induced by high intensity shaking, such as rock fragmentation and rockfall, revealed the presence of proximal active faults in the Christchurch area prior to the recent earthquake sequence. Development of robust earthquake shaking proxy datasets should become a higher scientific priority, particularly in populated regions.

https://gsa.confex.com/gsa/2014AM/finalprogram/abstract_247565.htm